CLUTCHLESS COMPRESSOR

Technical Field

The present invention relates to a clutchless compressor, more particularly, which is structured to interrupt power transmission from a vehicle engine to a compressor which is actuated by the engine at occurrence of overload torque.

Background Art

In general, an air conditioning system of a vehicle serves to maintain the temperature of a vehicle indoor lower than that of a vehicle outdoor based upon a circulation cycle of refrigerant such as compression, condensation, expansion and evaporation process. The air conditioning system essentially has a compressor, a condenser, an expansion valve and an evaporator which constitute the circulation cycle.

Recently, there is a gradual increase in a demand for variable compressors that can variably adjust the power according to air conditioning conditions. Such a variable compressor does not need a clutch for regulating driving power which is transmitted from an engine to the compressor.

In the clutchless compressor as above, when a trouble such as seizing occurs within the compressor, an overload torque exceeding a generally transmitted torque may take place, stopping rotation of a pulley for actuating the compressor. Then, a belt actuated by the engine continues to slip on the pulley so that it may be worn and broken by accompanied resistant heat.

As an approach to solve the above problems, Korean Patent Laid-open Publication No.10-2000-29525 filed by the present assignee discloses a clutchless compressor which is designed to interrupt power transmission.

FIG. 1 is a side sectional view of a conventional clutchless compressor, and FIG. 2 is a perspective view of a pulley and a cover plate shown in FIG. 1.

As shown in FIG. 1, a clutchless compressor comprises a circular pulley 100 connected with an engine via a belt 111 and a circular cover plate 200 which is installed in proximity of a side of the pulley 100 to be connected with a power shaft 112a of a

compressor 112. The pulley 100 is coupled with the cover plate 200 via a coupling means 300.

As shown in FIG. 2, the coupling means 300 includes break members 301 coupled to the pulley 100 and holding members 302 provided in a face of the cover plate 200 opposite to the pulley to be coupled with the break members 301. Each of the break members 301 includes an outer body 310 made of soft material and having at least one groove 311 in the outer periphery and an inner body 312 which is wrapped by the outer body 310 and has a groove 313 so that the holding member 302 can pass through the groove 313 for idle rotation when the outer body 310 is fractured by the holding member 302. The each holding member 302 also has a body 320 and projections 321 extended from both ends of the body 320 to be inserted into the grooves 311 of the outer body 310.

The holding members 302 are fixed respectively to the break members 301 to transmit power from the pulley 100 to the cover plate 200 (refer to a magnified part in FIG. 1). When a torque exceeding a threshold occurs at the compressor 112, the outer bodies 310 of the break members 301 which are relatively fragile than the holding members 302 are fractured and detached from the inner bodies 312 and the projections 321 of the holding members 302 pass through the grooves 313 to interrupt power transmission to the cover plate 200.

In the conventional clutchless compressor as above, the fractured outer bodies 310 may remain within the cover plate 200 to probably clog the grooves 313.

Moreover, the conventional coupling means 300 includes a number of parts such as the break members 301 each having the outer body 310 and the inner body 312, fastening member such as rivets 400 for coupling the break members 301 to the pulley 100, the holding members 302 and fastening means such as rivets 400 for coupling the break members 301 to the cover plate 200 to increase fabrication unit price and assembly cost.

Disclosure of Invention

The present invention has been devised to solve the foregoing problems and it is therefore an object of the invention to provide a clutchless compressor structured to

reliably interrupt power transmission in which the number of parts is reduced to save manufacturing cost and facilitate assembly.

According to an aspect of the invention, there is provided a clutchless compressor comprising: a pulley actuated by an engine; a connector member tightly fixed to an inner periphery of the pulley, and having a number of break portions defined by slots formed along the circumferential direction thereof; and a disk plate mounted on the connector member to be coupled with the connector member while being connected with a rotational shaft of the compressor.

It is preferred that the connector member includes an insert portion closely fit into the inner periphery of the pulley; and a coupling portion coupled with the disk plate, wherein the break portions connect the insert portion with the coupling portion.

It is preferred that the coupling portion has a number of projections projected radially from peripheral portions thereof, and the disk plate has coupling recesses formed in a face opposite to the pulley to correspond to the number of the projections, whereby the projections are inserted into the coupling recesses to connect the disk plate with the connector member.

In addition, a number of dampers are interposed between the projections and the coupling recesses, the dampers each being formed of a damping material.

It is preferred that the connector member includes: an insert portion closely fit into an inner periphery of the pulley; a flange connected with the insert portion and seated on a front portion of the pulley; and a coupling portion having a number of connecting slots formed along the circumferential direction thereof and coupled with the disk plate, wherein the break portions connect the flange with the coupling portion.

It is preferred that the disk plate has connecting projections formed in a face thereof opposite to the pulley to correspond to the number of the connecting slots, the connecting projections being coupled with the connecting slots.

In addition, a number of dampers are interposed between the connecting slots and the connecting projections, each of the dampers being formed of a damping material.

Brief Description of the Drawings

FIG. 1 is a side sectional view of a conventional clutchless compressor;

FIG. 2 is a perspective view of a pulley and a cover plate shown in FIG. 1;

FIG. 3 is an exploded perspective view of a clutchless compressor according to a first embodiment of the invention;

FIG. 4(a) is a perspective view of a connector member of the clutchless compressor shown in FIG. 3;

FIG. 4(b) is a side elevation view of a connector member of the clutchless compressor shown in FIG. 3;

FIG. 5 is a side sectional view of the assembled state of the clutchless compressor shown in FIG. 3;

FIG. 6 is an exploded perspective view of a clutchless compressor according to a second embodiment of the invention;

FIG. 7(a) is a perspective view of a connector member of the clutchless compressor shown in FIG. 6;

FIG. 7(b) is a side elevation view of a connector member of the clutchless compressor shown in FIG. 6; and

FIG. 8 is a side sectional view of the assembled state of the clutchless compressor shown in FIG. 6.

Best Mode for Carrying Out the Invention

Embodiments of the present invention will be described in detail hereinafter with reference with the appended drawings.

FIG. 3 is an exploded perspective view of a clutchless compressor according to an embodiment of the invention, FIG. 4(a) is a perspective view of a connector member of the clutchless compressor shown in FIG. 3, FIG. 4(b) is a side elevation view of a connector member of the clutchless compressor shown in FIG. 3, and FIG. 5 is a side sectional view of the assembled state of the clutchless compressor shown in FIG. 3.

As shown in FIG. 3, the clutchless compressor of the first embodiment comprises a pulley 10 actuated by an engine, a connector member 30 which is tightly fixed to the

inner periphery of the pulley 10 and has break portions 33 defined by slots formed along the circumferential direction thereof; and a disk plate 20 mounted on the connector member 30 to be coupled with the connector member 30 while being connected with a rotational shaft of the compressor.

The pulley 10 is made of metal or plastic, with a through hole formed in its central portion. The connector member 30 is closely fixed to the inner periphery of the through hole. On the outer periphery of the pulley 10, there is placed a belt (not shown) which is actuated by the engine.

The connector member 30 which is arranged in the inner periphery of the pulley 10 as described above is preferably made of metal such as aluminum or plastic. As shown in FIGS. 4(a) and 4(b), in a lower portion of the connector member 30, there is provided an insert portion 31 which is tightly fit into the inner periphery of the pulley 10. Above the insert portion 31, there is provided a coupling portion 32 of a diameter smaller than that of the insert portion 31.

Further, the break portions 33 are formed between the insert portion 31 and the coupling portion 32 to connect the insert portion 31 with the coupling portion 32. The break portions 33 are designed to be broken when a torque exceeding a threshold is applied to the break portions 33. A bearing 50 is fixedly installed in the inner periphery of the insert portion 31.

Further, a number of projections 34 projected radially from the outer periphery of the coupling portion 32 are wrapped in dampers 40 which will be described later.

The disk plate 20 is preferably made of plastic, and has a hub 22 installed in a central portion of the disk plate 20 and connected with a rotational shaft of the compressor. The hub 22 preferably is made of metal such as steel. It is preferred that the disk plate 20 is integrally formed with the hub 22 by integrally injecting plastic to the hub 22.

The disk plate 20 has coupling recesses 21 which are formed in a face opposite to the pulley 10 to correspond to the number of the projections 34 and in which the dampers 40 are installed. The coupling recesses 21 have insert grooves 23 at both sides for receiving fixing portions 41 of the dampers 40.

It is preferred that each of the dampers 40 is made of buffer material such as rubber, and shaped as a ring, as shown in FIG. 3, which is perforated downward. The inner periphery of the damper 40 is formed to match each of the projections 34 so that the projection 34 can be inserted into the damper 40. The outer periphery of the damper 40 is formed to match each of the coupling recesses 21 so that the damper 40 can be inserted into the coupling recess 21. On the outer periphery of the damper 40, there are formed fixing portions 41 which are inserted into the insert grooves 23. The dampers 40 of the above type function to relieve impact and alleviate vibration during operation of the compressor.

While it has illustrated in this embodiment that six projections 34 and three break portions 33 are formed, the number of the projections 34 is not limited to 6 or the number of the break portions 33 is not also limited to 3. The projections 34 and the break portion 33 may be formed of different numbers.

Hereinafter an assembly process of the variable compressor of this embodiment will be described with reference to FIGS. 3 and 5. The bearing 50 is first fixed to the inner periphery of the insert portion 31 of the connecting member 30. The insert portion 31 is tightly fixed to the inner periphery of the pulley 10 through press fit or double injection. Then, each of the dampers 40 is inserted into a corresponding projection 34 of the coupling portion 32, and into a corresponding coupling recess 21 of the disk plate 20 which is formed integral with the hub 22 (Refer to FIG. 3). Then, the rotational shaft (not shown) of the compressor is coupled with the hub 22 to complete the assembly process.

Hereinafter the operation of the clutchless compressor of this embodiment will be described.

When the pulley 10 is actuated by a belt (not shown) connected with an engine (not shown), a rotational torque is transmitted to the disk plate 20 via the connector member 30 to drive a compressor rotational shaft (not shown) connected with the hub 22.

If an obstacle such as seizing occurs within the compressor to stop rotation of the shaft, a torque larger than the rotational torque is applied to the disk plate 20. If the torque value exceeds a threshold, the break portion 33 of the connector member 30 is broken.

As a result, the disk plate 20 connected with the compressor rotational shaft stops its rotation, but the pulley 10 tightly fixed with the insert portion 31 of the connector member 30 continuously rotates, so as to prevent a potential accident that the belt is slipped off the outer periphery of the pulley to damage itself.

Hereinafter the second embodiment of the invention will be described in detail.

FIG. 6 is an exploded perspective view of a clutchless compressor according to the second embodiment of the invention, FIG. 7(a) is a perspective view of a connector member of the clutchless compressor shown in FIG. 6, FIG. 7(b) is a side elevation view of a connector member of the clutchless compressor shown in FIG. 6, and FIG. 8 is a side sectional view of the assembled state of the clutchless compressor shown in FIG. 6.

As shown in FIG. 6, the clutchless compressor of this embodiment comprises a pulley 10 actuated by an engine, a connector member 70 which is tightly fixed to the inner periphery of the pulley 10 and has break portions 74 defined by peripheral slots; and a disk plate 60 coupled with the connector member 70 and connected with a rotational shaft of the compressor.

This embodiment is the same as the first embodiment except for the disk plate 60 and the connector member 70, in which detailed description of the same construction will be omitted.

The connector member 70 is preferably made of metal such as aluminum or plastic. As shown in FIGS. 6, 7(a) and 7(b), the connector member 70 has an insert portion 71 in a lower portion thereof to be tightly fit into the inner periphery of the pulley 10, a flange 72 connected with the insert portion 71 to be seated on a front face of the pulley 10 and a coupling portion 73 formed above the flange 72 to be connected with the disk plate 60.

The insert portion 71 will not be described in detail since it is substantially the same as that in the first embodiment, in which a bearing 50 is fixed to the inner periphery of the insert portion 71.

The flange 72 has a diameter larger than a through hole of the pulley 10 as shown in FIGS. 6 and 8 in order to support the connector member 70 in front of the pulley 10.

In a face of the coupling portion 73 opposed to the disk plate 60, there are

provided a number of connecting slots 75 along the circumferential direction of the coupling portion 73 for receiving connector projections 61 of the disk plate 60 which will be described later.

Further, a number of break portions 74 are provided between the flange 72 and the coupling portion 73 to connect the flange 72 with the coupling portion 73. The break portions 74 are designed to be broken at a torque exceeding a threshold.

In a face of the disk plate 60 opposed to the pulley 10, connecting projections 61 are projected to be inserted into the connecting slots 75, formed of the number the same as that of the connecting slots 75. Preferably, dampers 80 made of buffer material such as rubber are interposed between the connecting slots 75 and the connecting projections 61 to provide a buffering function.

On the other hand, a number of connecting slots 75 can be formed in a face of the disk plate 60 and the connecting projections 61 can be formed in a face of the coupling portion 73. The number of connecting slots 75 is the same as that of connecting projections 61.

While it has illustrated in this embodiment that six projections 34 and three break portions 33 are formed, the number of the projections 34 is not limited to 6 or the number of the break portions 33 is not also limited to 3.

Hereinafter an assembly process of this embodiment will be described with reference to FIGS. 6 and 8. The bearing 50 is fixed to the inner periphery of the insert porction 71 of the connector member 70, and the insert portion 71 is tightly fixed to the inner periphery of the pulley 10 via press fit or double injection. Then, the connecting projections 61 of the disk plate 60 are inserted into the connecting slots 75 of the coupling portion 73. Preferably, the dampers 80 are interposed between the connecting slots 75 and the connecting projections 61 as described above. A rotational shaft (not shown) of the compressor is coupled with the hub 22 to complete the assembly process.

The operation of the clutchless compressor of this embodiment will not be described since it is substantially the same as the afore-described one of the first embodiment.

In this embodiment, the connector member 70 may have only three components

of the flange 72, the coupling portion 73 and the break portions 74 without the insert portion 71 to be fixedly inserted into a front face of the pulley 10.

Industrial Applicability

According to the clutchless compressor of the invention, the pulley is coupled with the disk plate via the connector member which is tightly fixed to the pulley, and the break portions in the connector member are broken in order to reduce the number of components necessary for coupling and breaking thereby to save manufacturing cost and facilitate assembly.

Further, the break portions are attached to the insert portion and the coupling portion of the connector member even after being broken in order not to obstruct rotation of the pulley so that power transmission can be reliably interrupted.